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# Antibiotic resistance of staphylococcus aureus and pseudomonas aeruginosa in the model of cystic fibrosis as a chronic disease of the bronchopulmonary system

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## Abstract

© 2018, Pediatria Ltd.. All rights reserved. The course and prognosis of cystic fibrosis (CF) in many ways depend on the degree of bronchopulmonary system lesion. Important role in the development of chronic inflammation in the bronchopulmonary system belongs to conditionally pathogenic microorganisms. Rational antibiotic therapy (ABT) allows to restrain the natural course of the disease. How ever, wide spread use of antibiotics (AB) creates problems of microorganisms' resistance. The article reviews the literature on antibacterial resistance (ABR) development mechanisms of Staphylococcus aureus and Pseudomonas aeruginosa, which most often colonize the respiratory tract in CF. Staphylococcus aureus and Pseudomonas aeruginosa ABR realizes by the mechanisms of natural and acquired resistance. The acquired resistance of bacteria develops as a result of natural selection through random mutations and/or through the action of antibacterial drugs. Microorganisms carry genetic information of resistance to antibiotics by horizontal gene transfer, which threatens the spread of multidrug resistant bacteria strains. Rational ABT is a key mechanism for restraining the development of bacteria antibiotic resistance.

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## Keywords

Antibacterial resistance, Cystic fibrosis, Pseudomonas aeruginosa, Staphylococcus aureus

## References

[1] Otto M. Staphylococcal biofilms. Curr. Top. Microbiol. Immunol. 2008; 322: 207–228.

[2] Ventola CL. The antibiotic resistance crisis: part 1: causes and threats. Pharmacy and Therapeutics. 2015; 40 (4): 2151–2177.

[3] Schroeder M, Brooks BD, Brooks AE. The Complex Relation ship between Virulence and Antibiotic Resistance. Genes. 2017; 8 (1): 39–67.

[4] Hughes D, Andersson DI. Environmental and genetic modulation of the phenotypic expression of antibiotic resistance. FEMS Microbiology Reviews. 2017; 41 (3): 374–391.

[5] Munita JM, Arias CA. Mechanisms of Antibiotic Resistance. Microbiology Spectrum. 2016; 4 (2): 481–511.

[6] Steven YC, Tonga S, Joshua D., Eichenbergerb E, Thomas L, Hollandband T. Staphylococcus aureus Infections: Epidemiology, Pathophysiology, Clinical Manifestations, and Management. Microbiol. 2015; 28 (3): 603–661.

[7] Vandenesch F, Lina G, Gillet Y. The end of the controversy: Panton Valentine is the culprit. Med. Sci. (Paris). 2009; 25 (11): 984–996.

[8] Vogel M, Roland P, Schmitz H, Brunkhors M. Infectious disease consultation for Staphylococcus aureus bacteremia – A systematic review and meta-analysis. Journal of Infection. 2016; 72: 19–28.

[9] Hiramatsu K, Cui L, Kuroda M, Ito T. The emergence and evolution of methicillin-resistant Staphylococcus aureus. Trends Microbiology. 2001; 9: 486–493.

[10] Noto MJ, Kreiswirth BN, Monk AB, Archer GL. Gene acquisition at the insertion site for SCCmec, the genomic island conferring methicillin-resistance in Staphylococcus aureus. Bacteriol. 2008; 190 (4): 1276-1283.

[11] Blair JM. Molecular mechanisms of antibiotic resistance. Nature reviews. Microbiology. 2015; 13 (1): 42.

[12] Morgan MS. Diagnosis and treatment of Panton – Valentine leukocidin (PVL) associated staphylococcal pneumonia. International Journal of Antimicrobial Agents. 2007; 30 (4): 289–296.

[13] Bush K, Jacoby GA. Updated functional classification of β-lactamases. Antimicrobial Agents and Chemotherapy. 2010; 54 (3): 969–976.

[14] Michael O. Staphylococcus aureus toxins. Current Opinion in Microbiology. 2014; 17: 32–37.

[15] Lefebvre E, Vighetto Ch, Di Martino P, Garde VL, Seyer D. Synergistic antibiofilm efficacy of various commercial antiseptics,enzymes and EDTA: a study of Pseudomonas aeruginosa and Staphylococcus aureus biofilms. International Journal of Antimicrobial Agents. 2016; 48: 181–188.

[16] Makaya PN, Guessennd NK, Kayath ChA, Gba KK, Gbonon V, Nguetta SPA, Dosso M. Emergence of Antibiotic Resistance and Correlation with the Efflux Pump in Pseudomonas aeruginosa Isolated from Abidjan Hospital. IJSR. 2017; 6 (3): 481–490.

[17] Hotterbeekx A, Kumar-Singh S, Goossens H, Malhotra-Kumar S. In vivo and In vitro Interactions between Pseudomonas aeruginosa and Staphylococcus spp. Frontiers in Cellular and Infection Microbiology. 2017; 7: 1–13.